SECTION 15420
PROCESS VESSELS FOR NUCLEAR SERVICE

PART 1 - GENERAL

1.1 SCOPE

A. This specification addresses the design, materials, testing and inspection, preparation for shipment, and documentation of Process Vessels for Nuclear Service.

1.2 INDUSTRY CODES AND STANDARDS

A. The Vessels shall be designed, fabricated, tested and inspected in accordance with the industry codes and standards listed below.
   1. ASME Boiler and Pressure Vessel Code, 1998 Base with 1999 Addenda, Section VIII, Div. 1.
   2. ASME B16.5 Pipe Flanges and Flanged Fittings, 1996.
   3. ASTM A 262, Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels.
   4. ASNT SNT-TC-1A , 1998.
   5. DOE-STD-1020-94 with Change Notice No. 1, January 1996.

1.3 RELATED SECTIONS

A. Section 09960, High Performance Coatings.

B. Section 15250, Mechanical Insulation.

1.4 QUALITY ASSURANCE

A. Process Vessels shall be furnished by a firm which is qualified and regularly engaged in this type of work. The firm shall maintain facilities for fabrication of subject items.

B. Materials and products used in the fabrication of Process Vessels shall be new. Materials shall be furnished and installed in strict accordance with Sub-Tier Supplier's current published recommendations, recognized good practices, Buyer supplied component drawings, and these specifications.

C. The Supplier shall have and maintain an approved quality control system that complies with the requirements of ASME Section VIII. The Supplier’s quality control system shall be reviewed and approved by the Buyer.

D. The Buyer reserves the right to access the Supplier's and Sub-Tier Supplier's facilities at which work is being performed. Access shall be provided for any personnel designated by the Buyer. The purpose of accessing facilities shall be to perform assessments, audits, reviews, surveillance, inspections, investigations, or test witnessing applicable to the work being performed by the Supplier or Sub-Tier Suppliers under this specification.

E. The Supplier shall resolve all deficiencies noted, to the Buyer's satisfaction. The Buyer's concurrence with "use-as-is" or "repair" disposition of any nonconformance must be obtained. Concurrence will not be unreasonably withheld. The terms "use-as-is, "repair, and "rework" are defined below.
   1. "Use-as-is" is a disposition permitted for a nonconforming item when it can be established that the item is satisfactory for its intended use.

2. "Repair" is the process of restoring a nonconforming characteristic to a condition to ensure that the capability of an item to function reliably and safely is unimpaired, even though that item still does not conform to the original requirements.
3. "Rework" is the process by which an item is made to conform to the original requirements by completion or correction.

F. Witness and hold points are specific points in the fabrication process requiring witnessing or verification by the Buyer. Activities shall not proceed past a hold point without witness or verification by the Buyer unless specifically waived in writing by the Buyer.

G. All provisions contained herein shall be extended to cover Sub-Tier Suppliers employed by the Supplier.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

A. The Vessel shall be a National Board registered ASME pressure vessel regardless of its design pressure and internal volume.

B. Nozzles shall be dimensionally in accordance with ASME B16.5. Specific nozzle configurations are addressed on the component drawings. Flanges on horizontal nozzles shall be oriented with two holes straddling the vertical centerline. Threaded connections are not permitted.

C. A minimum of four lifting lugs shall be welded to the Vessel shell for assemblies weighing more than 100 lbf. Lifting lug welds shall be visually inspected per ASME Section VIII, Division 1 Requirements.

D. Insulation clips shall be provided in accordance with SECTION 15250 to support insulation for process purposes and personal protection. This applies to Vessels with insulation requirements specified on the component drawings. Others will provide and install insulation.

E. The vessel shall be designed for a 40-year life.

F. The vessel and support structure shall be designed to withstand the loads described in DOE Standard 1020 for PC-2 equipment in addition to the loads described in the Boiler and Pressure Vessel Code. The site specific acceleration is (Ca) 0.21 and Ip 1.5. The Supplier shall submit the structural and vessel calculations prior to fabrication.

2.2 MATERIAL REQUIREMENTS

A. Materials are specified on the equipment data sheets and component drawings. The Supplier, on the fabrication drawings, shall indicate materials not addressed on the data sheets, and indicate the ASME material specifications for all material.

B. Nozzles shall be constructed using seamless pipe or seamless mechanical tubing.

C. Flat gaskets to be furnished with the Vessel are specified on the equipment data sheets. Gaskets shall be fabricated using 1/16” sheet material and cut from a single sheet whenever possible. Vulcanized or glued joints are acceptable and shall be indicated on the fabrication drawings.

D. Pipe flange gaskets furnished with the Vessel are specified on the equipment data sheets. The gasket class, as defined in ASME B16.5, shall match the flange rating for each nozzle.

E. Certified Material Test Reports (CMTRs) shall be provided for all Vessel components.

F. Carbon steel Vessels shall be supplied with one coat of primer per Section 09960.

G. Wetted stainless steel materials shall have passed ASTM Standard 262 practice A and C.

PART 3 - EXECUTION

3.1 FABRICATION REQUIREMENTS

A. Controls are to be exercised during all stages of fabrication to minimize exposure of stainless steel to contaminants including chlorides and carbon steel. Any compounds, liquids, or markers that come into contact with stainless steel surfaces shall not contain more than 250 ppm by weight chlorides.

B. Carbon arc or iron powder cutting shall not be used on stainless steel. All cut or raw edges shall be deburred and shall be smooth to the touch.

C. In order to preserve the original finish of stainless steel sheet material, care shall be exercised to prevent scratching, abrading, nicking, and denting during receiving, storage, fabrication and handling. The original protective coating shall be preserved as long as practical.

D. Grinding wheels and wire brushes shall either be new or previously used only on austenitic stainless steel. Wire brushes shall have stainless steel bristles.

3.2 TESTING AND INSPECTION

A. The Vessel shell shall be hydrotested per ASME Section VIII, Division 1 for a minimum of one hour.

B. Minimum radiographic inspection shall be performed in accordance with the ASME Boiler and Pressure Vessel Code per UW-52. Nozzles connections shall be inspected using magnetic particle examination per ASME Section VIII, Division 1, Appendix 6 or liquid penetrant examination per ASME Section VIII, Division 1, Appendix 8.

C. Instruments used for testing and inspection shall carry a current certification from NIST.

3.3 PACKAGING, DELIVERY, STORAGE AND HANDLING

A. The Supplier shall thoroughly clean Process Vessels of water, debris, weld splatter, grease, oil, markings from pens and dyes, shop soil, visible rust, and other foreign matter before shipment. After the water rinse, inside surfaces shall be dried. Supplier shall seal closures, caps and plugs dust-tight.

B. Process vessels shall not be packaged and shipped until all testing and inspection has been performed and the results have been approved by the Buyer.

C. Process Vessels shall be shipped as completely assembled units. If shipping limitations restrict complete assembly shipments, the Supplier shall propose a recommended alternative for approval by the Buyer. Other components or items that may work loose or be lost in transit shall be packed separately.

D. Ship Vessels after they have been prepared for the intended method of transport. Lifting weight of large Vessels shall be clearly marked on the Vessel and in shipping documents. Each shipping package shall be labeled with a waterproof label indicating applicable component tag number.

E. The Supplier shall completely identify the quantity and location of temporary material contained within the Vessel for shipment, handling or storage.

F. The Supplier shall be responsible for the dimensional stability and overall integrity of the equipment during shipment. Any special lifting, rigging, or setting procedures shall be provided. The center of gravity shall be clearly marked on the equipment skids for hoisting and rigging purposes.

3.4 SUBMITTALS

A. A Fabrication Schedule shall be provided indicating all fabrication steps, hold points, tests and inspections. The Supplier shall provide to the Buyer a revised Fabrication Schedule within seven (7) working days of a modification to the contract, which revises the required delivery date or when other approved Buyer modifications change a scheduled assembly step, hold point, test or inspection.

B. A controlled copy of the Supplier's Quality Control System Manual, Certificates of Authorization, and an index of the implementing procedures shall be submitted with the proposal.

C. Welding Procedure Specifications (WPS), Welder Performance Qualifications, and supporting PQRs shall be submitted and shall address all joints required in the fabrication of Process Vessels. The WPSs shall also address weld repair and welding equipment.

D. The Supplier shall provide NDE test procedures, inspection procedures, and test reports for Process Vessels to the Buyer for review and comment at least two weeks prior to conducting said test or inspection.

E. The vessels shall receive a hydrostatic test per ASME Section VIII requirements. The Supplier's standard test procedure shall be submitted. The procedure shall describe how to accomplish the test operation and test report forms shall be included. The Supplier shall submit a hydrotest report.

F. The Supplier shall submit a complete package of material certifications for all materials used in the fabrication and assembly of vessels, including, but not limited to, stainless steel sheet, structural steel, welding filler rods, and fasteners. Material certifications shall be legible copies of Certified Mill Test Reports (CMTR) indicating chemical analysis, physical test data and heat number. Certificates of Conformance (CoC) may be submitted in lieu of CMTRs, with prior approval by the Buyer.

G. Non-Destructive Examination (NDE) personnel performing examinations and testing operations shall be certified per the guidelines of ASNT SNT-TC-1A. All NDE reports shall be signed by personnel holding either Level II or Level III certifications and who either performed or witnessed the examinations. The Supplier shall provide the NDE certifications for personnel performing or witnessing non-destructive examinations.

H. The Supplier shall submit an ASME compliant Manufacturer's Data Report for each Vessel.

I. The Supplier shall submit Fabrication and As-Built drawings for each Vessel.

J. The Supplier shall submit Structural and ASME Vessel calculations for each Vessel.

K. Detailed fabrication drawings indicating weld seams, nozzle details, and internals shall be submitted by the Supplier.

L. The Supplier shall submit a completed data sheet for each Vessel.

M. The Supplier shall submit a detailed cleaning procedure addressing the requirements of this specification.

N. A procedure addressing specific packaging and shipping requirements shall be submitted by the Supplier.

O. The Supplier shall draft specific handling instructions for Vessels. The instructions shall address field handling using lifting features designed by the Supplier.

P. A detailed dimensional inspection procedure shall be submitted. A dimensional inspection report for each Vessel shall be prepared by the Supplier.

Q. The Supplier shall prepare documentation packages with the proposal, prior to fabrication, and after fabrication in accordance with Table 15420-1.

Table 15420-1 Documentation Requirements

Document Description	*With Proposal*	*Prior to Fabrication*	*Prior to Shipment*
Quality Control System Manual	X		
Certificate of Authorization for Manufacture of Code Items	X		
ASME Manufacturer's Data Report	X*	X*	X
Detailed Fabrication Drawings		X	
Completed Data Sheet	X	X	
Hydrotest Procedure		X	
Non-Destructive Examination Procedure Addressing Radiographic, Magnetic Particle, and Liquid Penetrant Examination		X	
Non-Destructive Examination Report Addressing Radiographic, Magnetic Particle, and Liquid Penetrant Examination			X
Hydrotest Report			X
CMTRs for all Vessel Components		X	X
Fabrication and As-Built Vessel Drawings		X	X
Structural Calculations for Vessel and Support Structure		X	
Cleaning Procedure		X	
Packaging and Shipping Procedure		X	
Handling Instructions			X
Welder Performance Qualifications		X	
NDE Personnel Certifications		X	
Fabrication Schedule	X		
Dimensional Inspection Procedure		X	
Dimensional Inspection Report			X
Welding Procedure Specifications		X	
Procedure Qualification Reports		X	

*Sample

END OF SECTION 15420